**R02 - Topics 3 – Periodicity:** Name:

Date:

Course: IB Chemistry

1. The first ionization energies, atomic and ionic radii of the elements Na to Ar are given in Table 7 of the Data Booklet.

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|  | (a) | | | (i) | Account for the general increase in ionization energy across the period. | | | |
|  |  | | | (ii) | Explain why the first ionization energy of aluminium is less than that of magnesium. | | | |
|  |  | | | (iii) | Explain why the first ionization energy of sulfur is less than that of phosphorus. | | | |
|  | (b) | | |  | Explain why | | | |
|  |  | | | (i) | The magnesium ion is much smaller than the magnesium atom | | | |
|  |  | | | (iii) | The ionic radius of Na+ is less than that of F‑. | | | |
| **2** |  | | | (i) | Write the equation for the reaction that occurs when a small piece of lithium is added to water, and describe **two** observations you could make during the reaction. State what additional **observation** could be made if potassium were used instead of lithium. | | | |
|  |  | | | (ii) | State and explain the trend in reactivity towards water shown by the elements lithium, sodium and potassium. | | | |
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|  | (b) | | |  | Two characteristics of the d-block (transition) elements are that they exhibit variable  oxidation states and form coloured compounds. | | | |
|  |  | | | (i) | State **two** possible oxidation states for iron and explain these in terms of electron  arrangements. | | | |
| 3 |  | | |  | The following list of elements is needed to answer 1(a) | | |  |
|  |  | | |  | N, O, F, Na, Mg, Al, Si, P, S, Cl. | | |  |
|  | (a) | | |  | Identify which **two** elements will form the most ionic compound. Explain your answer. | | |  |
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| 4 |  | | |  | List the formulas of the chlorides of Na, Mg, Al, Si and P. Why is there no chloride of argon? | | |  |
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|  | (c) | | |  | Write a balanced equation to show what happens when FeCl3 is added to water. | | |  |
|  | (d) | | |  | Describe and explain the redox reactions of Cl2, Br2 and I2 with Cl-, Br- and I- ions. | | |  |